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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/994,602	11/27/2001	Masamichi Shibata	2635-37	9862

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EXAMINER

KRISHNAN, SUMATI

ART UNIT PAPER NUMBER

2875

DATE MAILED: 05/21/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/994,602

Applicant(s)

SHIBATA ET AL.

Examiner

Sumati Krishnan

Art Unit

2875

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 25-27 is/are allowed.
- 6) ☒ Claim(s) 1-3, 5, 6, 8-10 and 12-24 is/are rejected.
- 7) ☒ Claim(s) 4, 7 and 11 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Objections

Claim 18 is objected to because of the following informalities:

the limitations stating "wherein said center electrode tip has a cylindrical shape with a cross section in a range from .." and "ground electrode tip has a cylindrical shape with a cross section in a range from..." are not clear. Suggested correction would read "wherein said [ground/center] electrode tip has a cylindrical shape with a cross sectional area in a range from" Appropriate correction is required.

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the claimed subject matter of claim 19 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

The disclosure is objected to because of the following informalities: the claimed subject matter of claim 19 is not disclosed in the specification.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2, 5,8-9 12-13,15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakahara (JP-59119692). Nakahara discloses :

a center electrode accommodated in said metallic housing, with one end protruding and extending from one end of said metallic housing,

a center electrode tip fixed to said one end of said center electrode and extending in the same direction as an axis of said center electrode, or extending outward from said center electrode,

a ground electrode having a proximal portion fixed to said one end of the metallic housing and a distal portion extending toward said one end of said center electrode and

a columnar ground electrode tip fixed to an end surface (or side surface, facing center electrode) of said distal portion of the ground electrode, with an apical surface of said ground electrode tip opposed to an apical surface of said center electrode tip via a discharge gap

wherein an acute angle is formed between an axis of said distal portion of the ground electrode and said axis of said center electrode when said ground electrode is projected on a

virtual plane including said axis of the center electrode where the ground electrode is fixed to said metallic housing ,

said ground electrode tip extends along an axis crossing with the axis of the distal portion of the ground electrode, so that said ground electrode tip protrudes from the end surface of the distal portion of said ground electrode and extends towards said center electrode and

an axis of said center electrode tip is in a cross or skew relationship with an axis of said ground electrode tip.

a fixing portion of said ground electrode tip to said ground electrode being further from the metallic housing in an axial direction of said center electrode than the apical surface of the center electrode tip

a crossing angle between the axis of the center electrode tip and the axis of the ground electrode tip being in an angular range of 5-70 degrees.

See figure 2.

Although Nakahara does not explicitly disclose a cylindrical metallic housing, it is well known in the art for a spark plug to employ this sort of housing. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a metallic cylindrical housing in the invention of Nakahara.

Claims 3,6,10,14 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakahara (JP59-119692) in view of Mitsudo et al (US 4109633). Nakahara does not explicitly disclose the length of the protrusion of the ground electrode tip with respect to the side surface of the distal portion of the ground electrode. Mitsudo, however, discloses a spark plug having a

ground electrode including a ground electrode tip protruding toward the center electrode, with the length of the protrusion with respect to the side surface of the distal portion of the ground electrode, h_1 , being various values from 0.07 mm – 1 mm, which satisfies the claimed range of 0.3-1.5 mm. Mitsudo discloses that a protrusion of a length falling in this range provides for a spark plug with superior electro-corrosion resistivity, thus achieving a longer service life.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the teaching of Mitsudo to design the ground electrode tip protruding toward the center electrode with a length as disclosed by Mitsudo. See col. 26 and table 3.

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakahara (JP59-119692) in view of Chiu et al (US 5856724). Nakahara discloses the spark plug of claim 1, but does not disclose the cross sectional areas of the ground and center electrode tips. Chiu, however, discloses the cross sectional areas of both the ground and center electrode tips to be in the range from 0.35-0.85 mm². Chiu discloses that the firing tips effectively maintain the demand voltage at a lower level over a longer period of operation when configured as disclosed. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the cross sectional areas as disclosed by Chiu in the invention of Nakahara in order to maintain the demand voltage at a lower level over a longer period of time.

Claims 19 and 21-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakahara (JP59-119692) in view of Yamaguchi (US 4700103). Nakahara discloses the spark plug of claim 1, but does not disclose the ground electrode having a tapered shape with a cross sectional area gradually narrowing with decreasing distance from said end surface. Yamaguchi,

however, discloses a spark plug having a ground electrode with a tapered shape with a cross sectional area gradually narrowing with decreasing distance from said end surface. See figure 21(b). Yamaguchi discloses that a tapered shape such as this has the advantage that the flame extinguishing effect or action can be considerably decreased. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the invention of Nakahara to include the tapered shape of the ground electrode in order to decrease the flame extinguishing effect.

Regarding claims 21-23, Yamaguchi discloses 1 or both of the tips (of the ground electrode and center electrode) made of a Pt-Ir alloy in an amount which satisfies the claimed compositions.

Regarding claim 24, it would have been obvious to adapt the invention of Nakahara and Yamaguchi to include the claimed composition of claim 24 because applicant has not disclosed that this composition provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art would have expected applicant's invention to perform equally well with either the composition as taught by Yamaguchi or as claimed in claim 24 because both compositions provide the tips made out of a noble metal. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the composition as claimed in claim 24 for the metal tips of the electrodes.

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakahara (JP59-119692) in view of Bronchart (US 4970426). Nakahara discloses the spark plug of claim 1, but does not disclose the ground electrode having an outer layer made of a Ni alloy and an inner layer made of a copper or copper alloy. Bronchart, however, discloses a spark plug consisting of

an outer layer and of an inner core made of different materials, the outer layer being for example made of a nickel alloy and the inner core being for example made of copper .

Bronchart discloses that such a bi-metal ground electrode has a longer life period because it has a better resistance to corrosion. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included this bi-metal structure in the ground electrode of Nakahara in order to provide an electrode with a longer life.

Allowable Subject Matter

Claims 4,7, and 11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 25-27 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: the prior art of record neither shows nor suggests a spark plug wherein:

a point 'A' of said ground electrode tip closest to said center electrode tip is expressed by a coordinate value $(-b/2, x)$ when a point 'B' on the apical surface of said center electrode tip closest to said ground electrode is expressed by a coordinate value $(-b, 0)$, where x represents a discharge gap, and

an axial deviation amount between the axis of said center electrode tip and the axis of said ground electrode tip is within $(+/-)d/2$ in a direction normal to said

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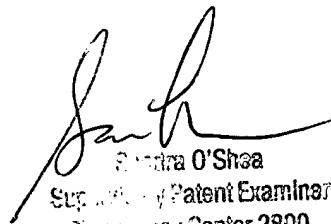
coordinate plane, and a swing amount of said closest point 'A' is within (+-) d/2 mm in a direction parallel to said X axis, where 'd' represents a diameter of said ground electrode tip.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sumati Krishnan whose telephone number is 703-305-7906. The examiner can normally be reached on 8:00 am - 4:30 pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sandra O'Shea can be reached on 703-305-4939. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9318 for regular communications and 703-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

SK
May 15, 2003


Sandra O'Shea
Supervisory Patent Examiner
Technology Center 2800